Travers

bushfire & ecology

bushfire protection assessment

Proposed Subdivision
Lot 1 DP 408800
62 Hillside Road, Newport

Under Section 100B of the Rural Fires Act (1997)

May 2016
(REF: A15164)

Bushfire Protection Assessment

Proposed Subdivision
Lot 1 DP 408800
62 Hillside Road, Newport

Report Authors:	John Travers BPAD-L3 15195 & Nicole van Dorst BPAD 23610
Plans prepared:	Emma Buxton
Checked by:	John Travers BPAD-L3 15195
Date:	18 May 2016
File:	A15164

This document is copyright ©

Disclaimer:

This report has been prepared to provide advice to the client on matters pertaining to the particular and specific development proposal as advised by the client and / or their authorised representatives. This report can be used by the client only for its intended purpose and for that purpose only. Should any other use of the advice be made by any person including the client then this firm advises that the advice should not be relied upon. The report and its attachments should be read as a whole and no individual part of the report or its attachments should be relied upon as meaning it reflects any advice by this firm. The report does not suggest or guarantee that a bush or grass fire will not occur and or impact the development. This report advises on matters published by the *NSW Rural Fire Service* in their guideline *Planning for Bush Fire Protection 2006* and other advice available from that organisation.

The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

ABN 64 083 086 677
PO Box 7138
Kariong NSW 2250

38A The Avenue
Mt Penang Parklands
Central Coast Highway
Kariong NSW 2250

t: 02 4340 5331
e: info@traversecology.com.au
www.traversecology.com.au

EXECUTIVE SUMMARY

A bushfire protection assessment has been undertaken for the proposed four (4) lot subdivision of Lot 1 DP 408800. It is noted that a development consent exists on the property for upgraded driveway access.

The development is categorised by the NSW Rural Fire Service (RFS) as being a residential subdivision and this requires the RFS to issue a bushfire safety authority (BSA) in accordance with *Planning for Bush Fire Protection 2006 (PBP).*

PBP dictates that the subsequent extent of bushfire attack that can potentially impact a building envelope in a proposed allotment should exceed a radiant heat flux of 29kW/m^2 for residential subdivision development. This rating assists in determining the size of the asset protection zone (APZ), which provides the necessary defendable space between hazardous vegetation and a building.

The assessment found that bushfire can potentially affect the proposed development from the littoral rainforest vegetation located external to the sites western, eastern and south-eastern boundary and within the site to the north resulting in the proposed buildings being exposed to potential radiant heat and ember attack.

The bushfire risk posed to the development can be mitigated as appropriate bushfire protection measures will be in place and managed in perpetuity.

Previous RFS involvement in the development of this land recognised the low bushfire hazard on the rainforest lands and as a result provided dispensations from applying the full requirements of PBP. This report recognises those same dispensations.

The assessment has concluded that the proposed development will provide compliance with *PBP* with the provision of an;

- 88B easement agreement to ensure the ongoing management of the asset protection zone over the adjoining Lot 2 DP 1036400 to the west.

- Alternate solution for the public road access to the site to include a turning ‘Y’ head and a 20m long passing bay. The carriageway width is 6.5m with a short pinch point of 3.5m based on site constraints.

GLOSSARY OF TERMS

AHIMS	Aboriginal Heritage Information System
APZ	Asset protection zone
AS1596	*Australian Standard – The storage and handling of LP Gas*
AS2419	*Australian Standard – Fire hydrant installations*
AS3745	*Australian Standard – Planning for emergencies in facilities*
AS3959	*Australian Standard – Construction of buildings in bushfire-prone areas 2009*
BAL	*Bushfire attack level*
BCA	*Building Code of Australia*
BSA	Bushfire safety authority
EP&A Act	*Environmental Planning & Assessment Act 1979*
FDI	Fire danger index
IPA	Inner protection area
LEP	Local Environmental Plan
OPA	Outer protection area
PBP	*Planning for Bush Fire Protection 2006*
RF Act	*Rural Fires Act 1997*
RFS	NSW Rural Fire Service
SFPP	Special fire protection purpose

TABLE OF CONTENTS

Introduction 1

Travers bushfire & ecology has been commissioned to undertake a bushfire protection assessment for the proposed four (4) lot subdivision of Lot 1 DP 408800 No. 62 Hillside Road, Newport.

The proposed subdivision is located on land mapped by Pittwater Council as being bushfire prone. This triggers a formal assessment by Council in respect of the NSW Rural Fire Service (RFS) policy against the provisions of *Planning for Bush Fire Protection 2006 (PBP).*

1.1 Aims of the assessment

The aims of the bushfire protection assessment are to:

- Review the bushfire threat to the landscape
- Undertake a bushfire attack assessment in accordance with *PBP*
- Provide advice on mitigation measures, including the provision of asset protection zones (APZs), construction standards and other specific fire management issues
- Review the potential to carry out hazard management over the landscape

1.2 Project synopsis

The proposal involves the four (4) lot subdivision of the site to create four dwelling footprints clustered within the central portion of the site (refer Figure 1.1).

A variable width public road will extend from the north-western end of Hillside Road to provide access to the central portion of the site. The driveway is subject to current approval (DA no. 274/09). This subdivision DA proposes the following changes to the approved road design:

- Increasing the road width from 3m to 6.5m in compliance with the acceptable solutions of PBP for public roads. There is a short pinch point of 3.5m on the road due to site constraints however a passing bay has been provided to compensate for this short reduced width.

- Provision of a turning 'Y' for fire trucks within adjoining Lot 2 DP 1036400 (in the west)

Schedule 1 shows the proposed subdivision, proposed dwellings and bushfire protection measures, including APZs. The APZ includes an 88B easement agreement over the adjoining Lot 2 DP 1036400 to the west.

New plan to be inserted

Figure 1.1 – Proposed subdivision

1.3 Information collation

To achieve the aims of this report, a review of the information relevant to the property was undertaken prior to the initiation of field surveys. Information sources reviewed include the following:

- Subdivision plans prepared by *Martens & Associates Pty Ltd, 25/2/16*
- Arborist report prepared by *Footprint Green (dated,)*
- Flora and Fauna Assessment prepared by *Cumberland Ecology (dated,)*
- Local environmental plans
- *NearMap* aerial photography
- Topographical maps DLPI of NSW 1:25,000
- Australian Standard 3959 *Construction of buildings in bushfire-prone areas* (AS3959)
- *Planning for Bush Fire Protection (PBP)*

An inspection of the proposed development site and surrounds was undertaken by John Travers on 15 September 2015 to assess the topography, slopes, aspect, drainage, vegetation and adjoining land use. The identification of existing bushfire measures and a visual appraisal of bushfire hazard and risk were also undertaken.

Previous RFS involvement in the development of this land recognised the low bushfire hazard on the rainforest lands along the western boundary and as a result provided dispensations from applying the full requirements of PBP. This report recognises those same dispensations.

These came about during a NSW Land and Environment Court case in 2006 (Case 10016) whereby the RFS recognised the peripheral development that was insitu and the proposed development that would be in position after approval.

The Rural Fire Service has advised the author of the SIS *Cumberland Ecology* that based on the nature of the vegetation, and the nature and circumstances of the site, there is no requirement for a substantial opening of the canopy for bushfire protection (SIS section 8.2.4). It is also noted that trees which are to be removed will be preferentially chosen from non-rainforest species on the site. These species are the more likely to burn in the event of fire.

1.4 Site description

The property is located at the north-eastern end of Hillside Road (Lot 1 DP 408800), Newport within the local government area (LGA) of Pittwater. Access to the site will be provided via the approved driveway which traverses adjoining Lot 2 to the west.

The site is bound by adjoining residential allotments to the south-west & west. Adjoining Lot 2 (west) has been approved for a two (2) lot subdivision (DA N0730/10) and a 10m wide asset protection zone has been implemented as part of that development consent.

The land within the site to the north consists of littoral rainforest (proposed vegetation width of 30–40m) with residential development fronting Kanimbla Crescent further north. A mixture of littoral rainforest and forest communities extend to the east within Attunga Reserve (refer Figure 1.2)

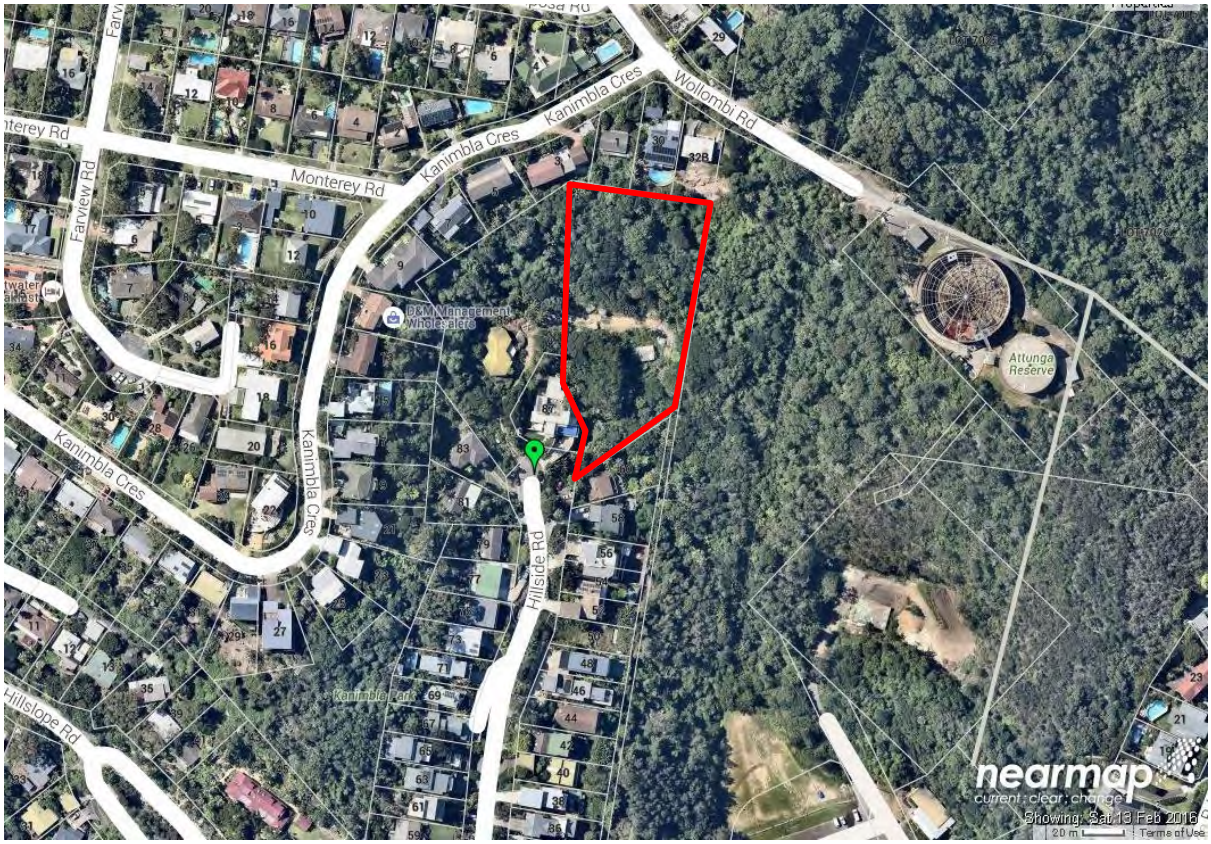


Figure 1.2 – Aerial appraisal

1.5 Legislation and planning instruments

1.5.1 Environmental Planning and Assessment Act (EP&A Act)

The *EP&A Act* governs environmental and land use planning and assessment within New South Wales. It provides for the establishment of environmental planning instruments, development controls and the operation of construction controls through the *Building Code of Australia (BCA)*. The identification of bushfire prone land is required under Section 146 of the *EP&A Act*.

1.5.2 Bushfire prone land

Bushfire prone land maps provide a trigger for the development assessment provisions. The proposed development is located on land that is mapped by Pittwater Council as being bushfire prone.

The proposed development is an integrated development under Section 91 of the *EP&A Act 1979*. Consequently, the proposed residential development will require a bushfire safety authority (BSA) from the NSW Rural Fire Service (RFS). The Commissioner must be satisfied that the proposal complies with *PBP* before granting a BSA.

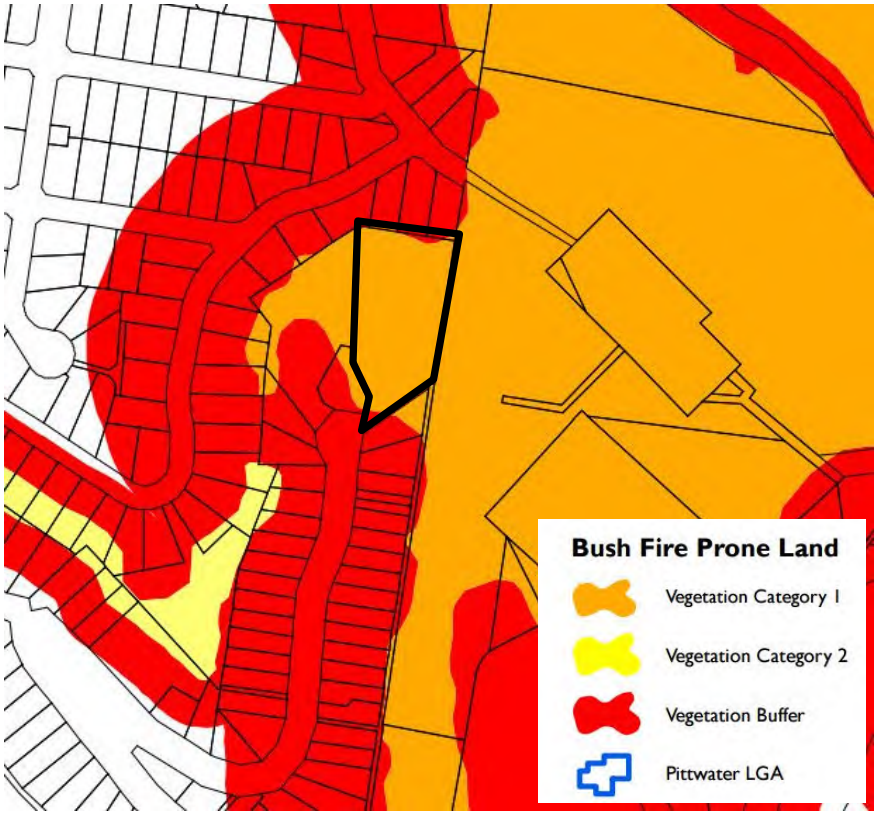


Figure 1.3 – Bushfire Prone Land Map (Pittwater Council, 2013)

1.5.3 Rural Fires Act (RF Act)

This legislation is concerned with the prevention and control of bushfire, hazard reduction and administration. Section 100B of the *Rural Fires Act* states that the Commissioner may issue a BSA for a subdivision development on bushfire prone land.

1.5.4 Local environmental plan (LEP)

A LEP provides for a range of zonings which list development that is permissible, or not permissible, as well as the objectives for development within a zone.

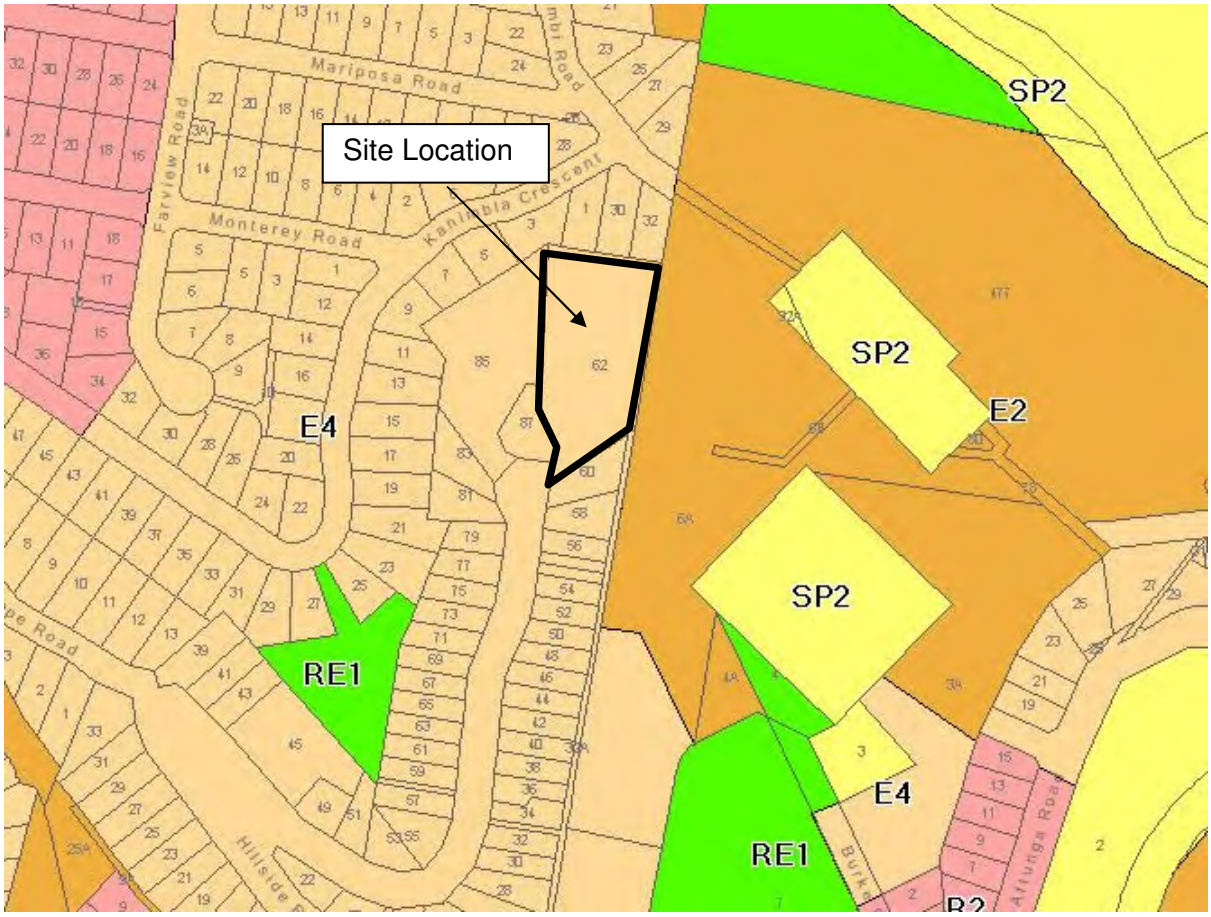


Figure 1.4 – Zoning map
(source: Pittwater LEP, 2014)

The site, and adjoining lands to the north, south and west, is zoned under the Pittwater LEP (2014) as E4 – Environmental Living. The adjoining land to the east is zoned is zoned E2 – Environmental Conservation

The proposal, including the provision of APZs, will seek to retain as many trees as possible to reduce the environmental impact of the development, to be consistent with the objectives of the zoning.

1.5.5 Planning for Bush Fire Protection 2006 (PBP)

Bushfire protection planning requires the consideration of the RFS planning document entitled *PBP. PBP* provides planning controls for building in bushfire prone areas as well as guidance on effective bushfire protection measures. The policy aims to provide for the protection of human life (including fire fighters) and to minimise impacts on property and the environment from the threat of bushfire, while having due regard to development potential, on site amenity and protection of the environment. *PBP* outlines the following general objectives that must be achieved for all development, as well as the specific objectives for subdivision development.

1. Afford occupants of any building adequate protection from exposure to a bushfire

2. Provide for a defendable space to be located around buildings

3. Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition

4. Ensure that safe operational access and egress for emergency service personnel and residents is available

5. Provide for ongoing management and maintenance of bushfire protection measures, including fuel loads in the APZ

6. Ensure that utility services are adequate to meet the needs of fire fighters (and others who may assist in bushfire fighting)

More specifically, the objectives for subdivision development are to:

7. Minimise the perimeters of the subdivision exposed to the bushfire hazard

8. Minimise bushland corridors that permit the passage of fire

9. Provide for the siting of future dwellings away from ridge tops and steep slope, particularly up slopes, within saddles and narrow ridge crests.

10. Ensure that separation distances (APZs) between the bushfire hazard and future dwellings enable conformity with the deemed to satisfy requirements of the *BCA.*

11. Provide and locate, where the scale of development permits, open space and public recreation areas as accessible public refuge areas or buffers (APZs)

12. Ensure the ongoing management of APZs

13. Provide clear and ready access from all properties to the public road system for residents and emergency services

14. Ensure the provision and adequate supply of water and other services to facilitate effective fire fighting

PBP outlines the bushfire protection measures required to be assessed for new development in bushfire prone areas. The proposal has been assessed in compliance with the following measures:

- Asset protection zones
- Building construction and design
- Access arrangements
- Water supply and utilities
- Landscaping, and
- Emergency management arrangements.

1.5.6 Building Code of Australia and the Australian Standards AS3959 - 2009

The *BCA* is given effect through the *EP&A Act* and forms part of the regulatory environment of construction standards and building controls. The *BCA* outlines objectives, functional statements, performance requirements and deemed-to-satisfy provisions. For residential dwellings these include Classes 1, 2 & 3 buildings. The construction manual for the deemed to satisfy requirements is AS3959.

1.6 Environmental constraints

A flora and fauna report has been prepared by *Cumberland Ecology* and an arborist report has been prepared by *Footprint Green*.

Consultation with these firms has been undertaken to reduce the environmental impact of the development and asset protection zones, whilst complying the standards required for an asset protection zone.

A basic search was conducted on the Aboriginal Heritage Information System (AHIMS). The results show that there are no identified Aboriginal sites of significance within Lot 1 DP 408800 or within 50m of the site.

Bushfire Threat Assessment

2

To assess the bushfire threat and to determine the required width of an APZ for a development, a review of the elements that comprise the overall threat needs to be completed.

PBP provides a methodology to determine the size of any APZ that may be required to offset possible bushfire attack. These elements include the potential hazardous landscape that may affect the site and the effective slope within that hazardous vegetation.

2.1 Hazardous fuels

PBP guidelines require the identification of the predominant vegetation formation in accordance with David Keith (2004) to determine APZ distances for subdivision developments. The hazardous vegetation is calculated for a distance of at least 140m from a proposed building envelope.

The vegetation posing a bushfire threat to the site is identified within the Flora & Fauna Assessment prepared by *Cumberland Ecology* and verified in the field by John Travers (refer Figure 2.1.

The communities within 140m of the site are summarised within the following Table 2.1.

Table 2.1 –Vegetation Communities

Vegetation Community	David Keith (2004)	Vegetation Formation (PBP 2006)
Coastal Escarpment Littoral Rainforest	Rainforest	Rainforest
Central Coast Escarpment Moist Forest	Northern Hinterland Wet Sclerophyll Forest	Dry Sclerophyll Forest (i.e. trees <30m tall)
Coastal Sandstone Foreshores Forest	Sydney Coastal Dry Sclerophyll Forest	Dry Sclerophyll Forest
Coastal Headland Clay Heath	Coastal Headland Heath	Tall Heath

The predominate vegetation community posing a bushfire risk to the site is the rainforest vegetation located immediately abutting the development in the north, north-west, east and south-east boundary. A narrow piece of rainforest is also located along the western boundary in a moist landscape where it adjoins lots 1(a) and 1(c).

Rainforest adjoins the sites eastern boundary for a distance of 25–35 metres. This vegetation then transitions to a forest for 25m and then a tall heath community. The predominant vegetation is considered rainforest to this aspect as an adequate separation of 45m is provided between the dwellings and the forest community. The forest community is also very narrow in width with tall heath extending further east. As a result the forest

community would not contribute significantly to the bushfire behaviour within Attunga Reserve.

Figure 2.1 – Vegetation Communities (source: *Cumberland Ecology*)

2.2 Effective slope

The effective slope is assessed for a distance of up to 100m. Effective slope refers to that slope which provides the most effect upon likely fire behaviour. A mean average slope may not in all cases provide sufficient information such that an appropriate assessment can be determined.

The effective slope within the hazardous forest vegetation is summarised below:

- 21–26^0 upslope in the north;
- 0-5^0 upslope in the east;
- 9–18^0 downslope to the south-east; and
- 0–18^0 upslope to the west.

2.3 Bushfire attack assessment

It is important that the developer understands that there are different methods in determining APZ and BAL levels to ensure that there is a clear understanding of the implications for future dwelling construction:

Subdivision Approval – PBP 2006 Appendix 2 is used to determine APZ distances to achieve approval for subdivision development applications. This approach does not conform

to the construction code AS3959 *Construction of buildings in bushfire prone areas* in all cases and therefore can pose significant implications for future dwelling approval.

In order to avoid potential future complications the assessment in the following Table 2.2 has been undertaken using a deemed to satisfy and alternate solution approach which provides the following two (2) different results in terms of APZ and BAL level outcomes. Either of these methods can be used to achieve dwelling approval following subdivision.

- ***Deemed to satisfy approach*** (DS) – The deemed to satisfy approach is undertaken in compliance with AS3959 and is used by future lots owners to obtain approval for a construction certificate under complying development.

  The assessment uses Method 1 Table 2.4.2 of AS3959. This will allow future purchasers of each allotment to submit their application for building construction in accordance with the Code's SEPP (i.e. complying development). This is a simplified process and results in a cheaper bushfire assessment at building construction stage (refer Column 6 of Table 2.2). However it is often not the cheapest approach as BAL levels can be higher.

- ***Alternate solution approach*** (AS) – The alternative solution approach is undertaken in compliance with AS3959 Appendix B Method 2 to obtain an accurate BAL rating approval using reduced fuel loads and accurate slopes.

  This method maximises the developable area and can provide future lots owners with the best way to achieve cheaper building construction costs. However future purchasers will be required to lodge their dwelling application under Section 79BA of the *EP&A Act,* which will require a further bushfire protection assessment report (i.e. increased cost for report) to support the lower BAL level. Approval is also required from the RFS.

Please note that the APZs (based on a BAL 29 construction) depicted in Schedule 1 attached are based on an alternative solution approach as detailed in Column 5 (Table 2.1).

A fire danger index (FDI) of 100 has been used to calculate bushfire behaviour on the site based on its location within the Greater Sydney region. Table 2.2 provides a summary of the bushfire attack assessment using each of the above methods.

Whilst a recued flame width would be viable in this circumstance it is makes no difference to the calculation so it is left at 100m.

Modelling has been undertaken to reduce impact on insitu vegetation.

Table 2.2 – Bushfire attack assessment

Lots Vegetation formation within 140m of development (refer Note 1)	Effective slope of land	Minimum APZ required (Alternative solution approach)	APZ provided	Building construction standards (Alternative solution approach)	Building construction standards (Deemed to satisfy approach) (refer Note 2)
Northern aspect (Lot 1a & 1b)					
Rainforest (AS - 8/10t) (DS - 10/12t for forest)	21-26° U	4	5	BAL 29 (4-6) BAL 19 (6 -9) BAL 12.5 (9-100)	BAL 40 (8-11) BAL 29 (11-16) BAL 19 (16 -23) BAL 12.5 (23-100)
East & south-east (Lot 1b)					
Rainforest (AS - 8/10t) (DS - 10/12t for forest)	9° D	14	16	BAL 29 (14-21) BAL 19 (21-30) BAL 12.5 (30-100)	BAL 40 (13-18) BAL 29 (18-26) BAL 19 (26 -36) BAL 12.5 (36-100)
	Level to upslope	14 (based on 14m requirement above)	13.5	BAL 29 (11-13) BAL 19 (13-19) BAL 12.5 (19-100)	BAL 40 (8-11) BAL 29 (11-16) BAL 19 (16 -23) BAL 12.5 (23-100)
South-eastern aspect (Lot 1c)					
Rainforest (AS - 8/10t) (DS - 10/12t for forest)	18° D	23	23	BAL 29 (23-33) BAL 19 (33-45) BAL 12.5 (45-100)	BAL 40 (22-29) BAL 29 (29-42) BAL 19 (42 -56) BAL 12.5 (56-100)
South-eastern aspect (Lot 1d)					
Rainforest (AS - 8/10t) (DS - 10/12t for forest)	18° D	23	23	BAL 29 (23-33) BAL 19 (33-45) BAL 12.5 (45-100)	BAL 40 (22-29) BAL 29 (29-42) BAL 19 (42 -56) BAL 12.5 (56-100)
Western Aspect (Lot 1a)					
Rainforest (AS - 8/10t) (DS - 10/12t for forest)	Level to upslope	8.6	8.6	BAL 29 (8.6-13) BAL 19 (13 -19) BAL 12.5 (19-100)	BAL 40 (8-11) BAL 29 (11-16) BAL 19 (16 -23) BAL 12.5 (23-100)
Western Aspect (Lot 1c)					
Residential development (narrow strip (6-10m) of vegetation)	N/A	2m separation from trees / shrubs	2m (refer Note 4)	N/A	N/A

Note 1: Fuel loads utilised for each method is provided in brackets. AS – Alternate solution, DS – Deemed to satisfy.

Note 2: Under clauses 3.36B and 3A.37 of the Codes SEPP the construction of dwellings on some bush fire prone land may be considered as complying development. For complying development to occur on future allotments, the land must be certified as being below a BAL 29 risk rating and be provided a minimum setback as outlined in Column 6. A BAL Certificate must be obtained from the council or a person who is recognised by the RFS as a suitably qualified consultant in bush fire risk assessment prior to lodging an application for a CDC. Buildings assessed as BAL 40 or BAL FZ are not considered complying and must lodge their application under section 79BA and a full bushfire protection assessment must be prepared for submission to NSW RFS.

Note 3: A performance based assessment using Appendix B of *AS3959* was undertaken to determine the required APZ (equivalent to BAL 29 construction) based on rainforest vegetation (fuel load 8/10) on an upslope of 21^{o}, downslope of 9^{o} & 18^{o} and a level slope (determined to be the worst case scenario in each scenario). The results of the assessment, provided within Appendix 2, were prepared using the bushfire attack assessor (BFAA) developed by *Newcastle Bushfire Consulting*.

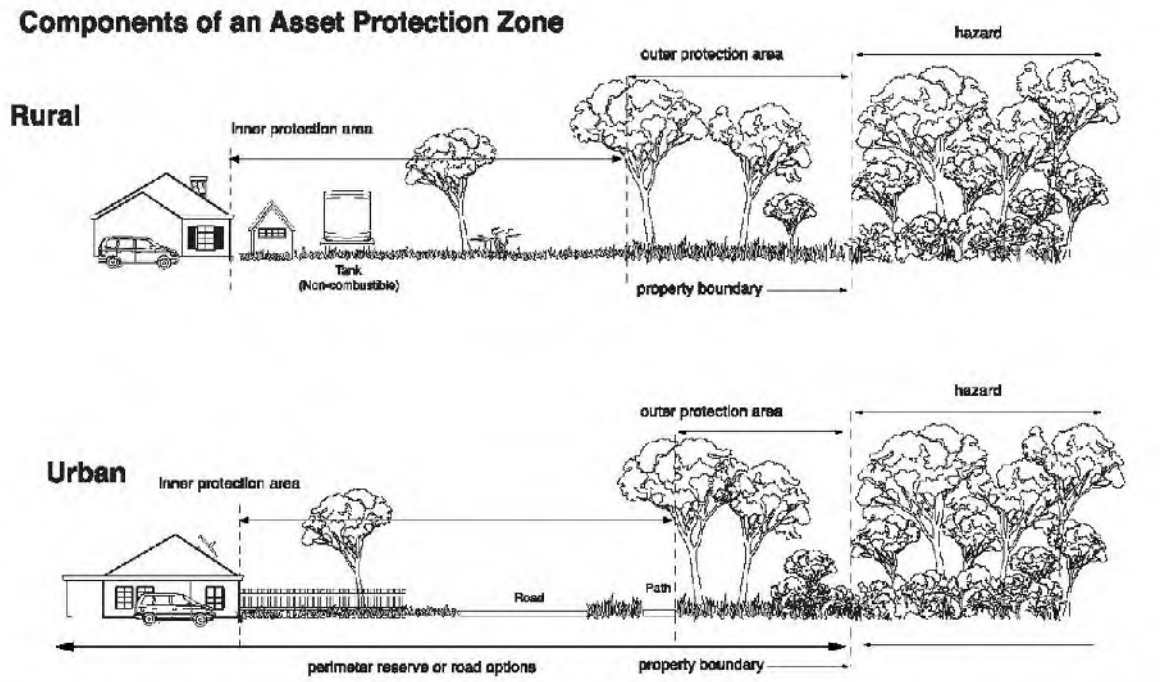
Note 4: The vegetation to the west of Lot 1C is very narrow in width and as a result does not pose a significant bushfire risk to the site. A separation 2m is recommended between the dwelling wall and tree / shrub vegetation.

Specific Protection Issues

3

3.1 Asset protection zones

APZs are areas of defendable space separating hazardous vegetation from buildings. The APZ generally consists of two subordinate areas, an inner protection area (IPA) and an outer protection area (OPA). The OPA is closest to the bush and the IPA is closest to the dwellings. The IPA cannot be used for habitable dwellings but can be used for all external non-habitable structures such as pools, sheds, detached garages, cabanas, etc. A typical APZ, and therefore defendable space, is graphically represented below:



APZs and progressive reduction in fuel loads (Source: RFS, 2006)

Note: Vegetation management as shown is for illustrative purposes only. Specific advice is to be sought in regard to vegetation removal and retention from a qualified and experienced expert to ensure APZs comply with the RFS performance criteria.

PBP dictates that the subsequent extent of bushfire attack that can potentially emanate from a bushfire must not exceed a radiant heat flux of $29 kW/m^2$ for residential subdivision developments. This rating assists in determining the size of the APZ to provide the necessary defendable space between hazardous vegetation and a building.

Table 3.1 outlines the proposal's compliance with the performance criteria for APZs

Table 3.1 – Performance criteria for asset protection zones (*PBP* guidelines pg. 19)

Performance criteria	Acceptable solutions	Complies
Radiant heat levels at any point on a proposed building will not exceed 29kW/m^2	APZs are provided in accordance with Appendix 2 APZs are wholly within the boundary of the development site	Complies - A performance based assessment has been undertaken as identified in Section 2.3
APZs are managed and maintained to prevent the spread of fire towards the building	In accordance with the requirements of *Standards for Asset Protection Zones* (RFS 2005)	Yes – can be made a condition of consent
APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is negated	The APZ is located on lands with a slope of less than 18^o	This is the case for Lot 1c and 1d. However the hand management of these lots after the construction of the APZ's will manage this In accord with the VMP prepared by *Cumberland Ecology*.

Note 1 – The impact of crown fire on the property is negated due to the uphill slopes in the north which would direct fire intensity away from the development. The vegetation community on site is a littoral rainforest and as such the very wet nature of this vegetation is unlikely to sustain an intense fire which would see fire move into the canopy. The RFS agreed with this contention in 2006 during a court case.

Maintenance of the APZ within the steeper lands will be undertaken using hand tools only. As detailed in the following Section 3.3 tree removal on slopes of >18 degrees will not occur and will be limited to tree pruning ensuring at least >75% of original canopy cover is retained.

3.2 Building protection

The construction classification system is based on five (5) bushfire attack levels (BAL). These are BAL – Flame Zone (FZ), BAL 40, BAL 29, BAL 19 and BAL 12.5 (AS3959 (2009) – *Construction of buildings in bushfire-prone areas*). The lowest level, BAL 12.5, has the longest APZ distance while BAL – FZ has the shortest APZ distance. These allow for varying levels of building design and use of appropriate materials.

The APZ provided (depicted in Schedule 1) is based on a BAL 29 construction standard for all dwellings. Please note that the BAL level is based on an alternative solution approach and therefore if using these BAL levels a further bushfire report will be required under Section 79BA of the *EP&A Act.*

Alternatively a future occupant may wish to proceed in accordance with the Code's SEPP (i.e. complying development). If proceeding as complying development a higher BAL level may be applicable.

3.3 Hazard management

Should the development be approved, the owner or occupier of each lot will be required to manage the APZ in accordance with RFS guidelines *Standards for Asset Protection Zones* (RFS, 2005), with landscaping to comply with Appendix 5 of *PBP*.

The asset protection zone extends into the adjoining Lot 2 DP 1036400 in the west. A Section 88B instrument will be obtained over the adjoining land for the purpose of

maintaining fuel levels to the specifications required for an asset protection zone. The nature of the easement agreement is to obtain approval from the landholder to enter their property to undertake hazard reduction works

The 88B instrument will identify the hazardous areas to be managed, the scope of the works required, the frequency of the works, the objectives of the works as well as the monitoring of the works.

In terms of implementing and / or maintaining APZs, there is no physical reason that would constrain hazard management from being successfully carried out by normal means (e.g. mowing / slashing / grazing).

Rainforest trees in the form of Cabbage Tree Palms may remain insitu as they do not contribute to fire behaviour when under fuels are well managed. Lower shrub species should be spatially separated into clumps. Low or ground species should be managed by raking and or brush cutting with excess removed of site. Excessive fuels on the ground surface (above 10-12mm from the soil) should be raked and removed off site.

In order to deny forward movement of a fire in the south western portion of Lot 1c a metal fence should be located as shown on Schedule 1 attached. This will have the effect of limiting fire movement into the narrow band of littoral rainforest on the western aspect of the proposed dwelling.

3.4 Access for fire fighting operations

A variable width public road will extend from the north-western end of Hillside Road to provide access to the central portion of the site. The driveway is subject to current approval (DA no. 274/09). This DA proposes the following changes to the road design:

- Increasing the road width from 3m to 6.5m in compliance with the acceptable solutions of PBP for public roads. There is a pinch point of 3.5m on the road due to slope constraints however a passing bay (20m long) has been provided to compensate for this short reduced width.

- Provision of a turning 'Y' for fire trucks within adjoining Lot 2 DP 1036400 (in the west)

Table 3.2 outlines the public roads compliance with PBP.

Table 3.2 – Performance criteria for public roads (*PBP* guidelines pg. 20)

Performance criteria	Acceptable solutions	Complies
Fire fighters are provided with safe all weather access to structures (thus allowing more efficient use of fire fighting resources).	Public roads are two-wheel drive, all weather roads.	Yes
Public road widths and design that allow safe access for fire fighters while residents are evacuating an area.	Urban perimeter roads are two way, that is, at least two traffic lane widths (carriageway 8m minimum kerb to kerb) allowing traffic to pass in opposite directions. Non perimeter roads comply with Table 3.3. Perimeter road is linked with the internal road system at an interval of no greater than 500m in urban areas. Traffic management devices are constructed to facilitate access by emergency services. Public roads have a cross fall not exceeding 3^{o}. All roads are through roads. If unavoidable, dead end roads are not more than 200m in length, incorporate a minimum 12m outer radius turning circle, sign posted dead end and direct traffic away from the hazard. Curves of roads (other than perimeter) have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress. The minimum distance between inner and outer curves is 6m. Maximum grades for sealed roads do not exceed 15^{o} and an average grade of not more than 10^{o}. Minimum vertical clearance of 4m above the road at all times.	Yes - The road width provided is 6.5m with a single short (5m) pinch point of 3.5m due to site constraints. Due to the low density (4 dwellings) it is not expected that this pinch point will pose any difficulties during an evacuation event with passing available both side and the provision of a turning 'Y' head. Discussions with the RFS on this matter in early 2016 recognised this and road changes were made to accommodate this constraint.

Performance criteria	Acceptable solutions	Complies
The capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles.	The capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles (15 tonnes for reticulated water and 28 tonnes for all other areas). Bridges clearly indicate load rating.	Yes – Can be made a condition of consent.
Roads that are clearly sign posed (with easily distinguishable names) and buildings / properties that are clearly numbered.	Public roads >6.5m wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water. Public roads 6.5 - 8m wide are No Parking on one side with the hydrant located on this side to ensure accessibility to reticulated water. Public roads <6.5m wide provide parking within parking bays and locate services outside of parking bays to ensure accessibility to reticulated water. One way only public access are no less than 3.5m wide and provide parking within parking bays and locate services outside of parking bays to ensure accessibility to reticulated water.	Yes – Can be made a condition of consent.
There is clear access to reticulated water supply. Parking does not obstruct the minimum paved width	Parking bays are a minimum of 2.6m wide from kerb edge to road pavement. No services or hydrants are located within parking bays. Public roads directly interfacing the bushfire hazard are to provide roll top kerbing to the hazard side of the road.	

Table 3.3 – Minimum widths for public roads that are not perimeter roads (*PBP* guidelines pg. 20)

Curve radius (inside edge) (metres)	Swept Path (metres width)	Single lane (metres width)	Two way (metres width)
<40	3.5	4.5	8.0
40-69	3.0	3.9	7.5
70-100	2.7	3.6	6.9
>100	2.5	3.5	6.5

3.5 Water supplies

Town reticulated water supply is available to the proposed subdivision.

Table 3.4 outlines the proposal's compliance with the performance criteria for reticulated water supply.

Table 3.4 – Performance criteria for reticulated water supplies (*PBP* guidelines pg. 27)

Performance criteria	Acceptable solutions	Complies
Water supplies are easily accessible and located at regular intervals.	Reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads. Fire hydrant spacing, sizing and pressures comply with AS2419.1 - 2005. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority, once development has been completed. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles. Hydrants are not located within any road carriageway All above ground water and gas service pipes external to the building are metal, including and up to any taps. The provisions of public roads are met.	Complies - can be made a condition of consent.

3.6 Gas

Table 3.5 outlines the required performance criteria for gas supply.

Table 3.5 – Performance criteria for gas supplies (*PBP* guidelines pg. 27)

Performance criteria	Acceptable solutions	Complies
Location of gas services will not lead to the ignition of surrounding bushland land or the fabric of buildings.	Reticulated or bottled gas bottles are to be installed and maintained in accordance with AS1596 – 2002 and the requirements of relevant authorities. Metal piping is to be used. All fixed gas cylinders are to be kept clear of flammable materials to a distance of 10m and shielded on the hazard side of the installation. If gas cylinders are to be kept close to the building the release valves must be directed away from the building and at least 2m away from any combustible material, so that they do not act as a catalyst to combustion. Connections to and from gas cylinders are metal. Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used.	Yes – any future gas supply is to comply with this acceptable solution.

3.7 Electricity

Table 3.6 outlines the required performance criteria for the subdivision's electricity supply.

Table 3.6 – Performance criteria for electricity services (*PBP* guidelines pg. 27)

Performance criteria	Acceptable Solutions	Complies
Location of electricity services limit the possibility of ignition of surrounding bushland or the fabric of buildings Regular inspection of lines in undertaken to ensure they are not fouled by branches.	Where practicable, electrical transmission lines are underground Where overhead electrical transmission lines are proposed: • Lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas: and • No part of a tree is closer to a power line than the distance set out in accordance with the specification in *Vegetation Safety Clearances* issued by *Energy Australia* (NS179, April 2002)	Can be made a condition of consent.

Conclusion & Recommendations

4

4.1 Conclusion

A bushfire protection assessment has been undertaken for the proposed four (4) lot subdivision of Lot 1 DP 408800.

The assessment found that bushfire can potentially affect the proposed development from the littoral rainforest vegetation located external to the sites eastern and south-eastern boundary and within the site to the north and west resulting in the proposed buildings being exposed to potential radiant heat and ember attack.

The bushfire risk posed to the development can be mitigated as appropriate bushfire protection measures will be in place and managed in perpetuity.

The assessment has concluded that the proposed development will provide compliance with *PBP* with the provision of an;

- 88B easement agreement to ensure the ongoing management of the asset protection zone over the adjoining Lot 2 DP 1036400 to the west.

- Alternate solution for the public road access to the site to include a turning 'Y' head and a 20m long passing bay. The carriageway width is 6.5m with a short pinch point of 3.5m based on site constraints.

- A metal fence is to be located in Lot 1c to deny forward movement of a fire – see Schedule 1.

The following recommendations are provided to ensure that the development is in accordance with, or greater than, the requirements of *PBP.*

4.2 Recommendations

Recommendation 1 - The subdivision is as generally indicated on the attached Schedule 1 – Plan of Bushfire Protection Measures.

Recommendation 2 - APZs are to be provided to the proposed development as outlined in Table 2.2 and as depicted within Schedule 1.

Recommendation 3 - Fuel management within the APZs is to be maintained by regular maintenance of the landscaped areas, mowing of lawns in accordance with the guidelines provided by the RFS in their publications. Rainforest trees in the form of Cabbage Tree Palms may remain insitu as they do not contribute to fire behaviour when under fuels are well managed. Lower shrub species should be spatially separated into clumps. Low or ground species should be managed by raking and or brush cutting with excess removed of site. Excessive fuels on the ground surface (above 10-12mm from the soil) should be raked and removed off site.

Recommendation 4 – Building construction standards for the proposed future dwellings are to be applied in accordance with *AS3959 Construction of buildings in bushfire prone areas (2009)* with additional construction requirements as listed within Section A3.7 of Addendum Appendix 3 *PBP*.

Recommendation 5 - Access is to comply with Table 3.2 of this report

Recommendation 6 - Water, electricity and gas supply is to comply with Section 4.1.3 of *PBP.*

Recommendation 7 - The landowner / manager is to be made aware of their liability to manage the development lands for the ongoing protection of themselves and their neighbours (refer Section 63(2) *Rural Fires Act*)

Recommendation 8 - Landowners living in bushfire prone areas should familiarise themselves with publications published by the NSW Rural Fire Service. These are located on the RFS web site www.rfs.nsw.gov.au under 'Publications'.

REFERENCES

Australian Building Codes Board (2010) – *Building Code of Australia*, Class 1 and Class 10 Buildings Housing Provisions Volume 2.

Chan, K.W. (2001) – *The suitability of the use of various treated timbers for building constructions in bushfire prone areas*. Warrington Fire Research.

Councils of Standards Australia AS3959 (2009) – *Australian Standard Construction of buildings in bush fire-prone areas.*

Keith, David (2004) – *Ocean Shores to Desert Dunes – The Native Vegetation of New South Wales and the ACT*. The Department of Environment and Climate Change.

Rural Fire Service (2006) - *Planning for bushfire protection – a guide for councils, planners, fire authorities and developers*. NSW Rural Fire Service.

Rural Fire Service (2006) - Bushfire Attack Software on RFS Web site.

Tan, B., Midgley, S., Douglas, G. and Short (2004) - *A methodology for assessing bushfire attack.* RFS Development Control Service.

Plan of Bushfire Protection Measures

S1

Management of Asset Protection Zones

A1

The RFS advises that when living in a bushfire prone environment APZs are required to be provided between hazardous fuels and a dwelling.

The RFS provides basic advice in respect of managing APZs in several documents namely, *Planning for Bush Fire Protection 2006 (PBP)* and *Standards for Asset Protection Zones* (undated but circa 2006).

APZs provide a level of defendable space between the hazard and a habitable dwelling or similar structure. These zones are usually shown on plans adjacent to either cultural or natural assets (e.g. dwelling). They act to significantly lessen the impact of intense fire. The major mitigating factor that limits the effects of wildfire is the amount of fuel available to burn. By reducing the amount of fuel there will be a reduction in the intensity of the fire.

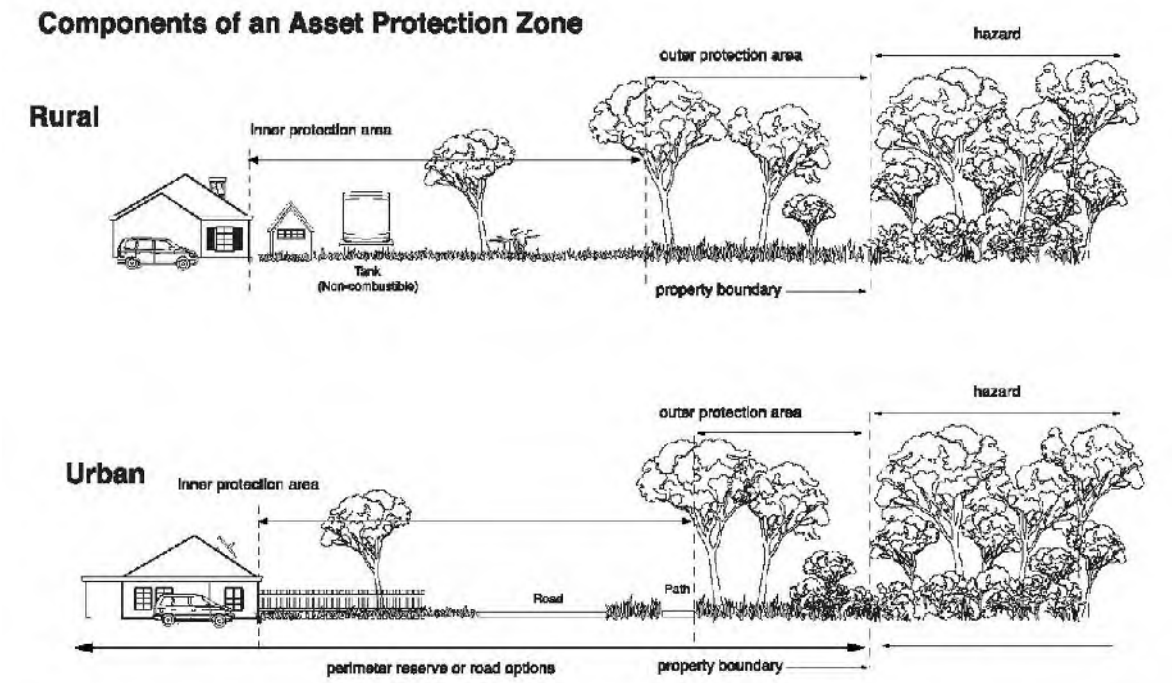
When considering bushfire fuel it is important to understand that it occurs in our native bushland in three vertical layers – see Table 1.

Table 1 – Fuel layers

Fuel layer name	Location of layer in vertical column	Type of fuel
Ground fuels	Below ground level	Peatmoss (always below the surface)
Surface fuels	0-200mm	Litter layer (leaves & twigs)
Aerial fuels	200 – 3000mm	Shrubs and grasses
Canopy fuels	> 3000mm	Tree canopy

The APZ can be further classified into two sub-zones with each having a specific role. These sub-zone areas are called the inner protection area (IPA) and the outer protection area (OPA) – see figure below.

The IPA is managed as a fuel free zone while the OPA is managed as a fuel reduced zone. This means that the fuel free zone has little fuel available to be consumed in the event of a fire whilst the fuel reduced zones has less than normal fuel levels that could be consumed in the event of a fire.



APZs and progressive reduction in fuel loads (Source: RFS, 2006)

Inner protection area (IPA)

This area is almost free of all fuels and usually takes the form of grassy areas, car parks, roads, concrete areas, tracks or trails. It does not imply or require the wholesale removal of every tree and / or shrub.

This zone is intended to stop the transmission of flame and reduce the transmission of radiant heat by the elimination of available fuel. This area also allows airborne embers to fall safely without igniting further outbreaks.

This zone also provides a safe fire fighting position and is operationally important for implementation of clear fire control lines.

Grasses may occur within an IPA if they are generally no higher than 50-75mm. Above this height, fuel weights tend to increase exponentially and consequentially cause greater flame heights and therefore fire intensity.

Shrubs may occur within an IPA in the form of clumping amidst open grassy areas. The design of the clumping will be dependent on species selection and spatial density. For example, the larger the shrubs the less clumping may occur in a given area.

As a general rule, trees are allowed within an IPA but only where those trees are at least 5m away from a dwelling.

A recommended performance standard for the fuel load of an IPA is between 0-4 t/ha. Shrubs may occur within an IPA commensurate with a spatial distribution of 15-20%. For example, an area of 100m2 (10mx10m) can have up to 20% of this area composed of shrubs.

If a shrub layer is present the following table shows the additional fuel weights that should be added to the calculated surface fuels.

Shrub cover	Fuel weight
10-30%	2.5 tonnes / ha
35-50%	5.0 tonnes / ha
55-75%	7.5 tonnes / ha

Performance based assessment

A2

NBC Bushfire Attack Assessment Report V2.1

AS3959 (2009) Appendix B - Detailed Method 2

Printed: 8/03/2016 **Assessment Date:** 4/03/2016

Site Street Address: Hillside Road, Newport

Assessor: Mr Admin; admin

Local Government Area: Pittwater **Alpine Area:** No

Equations Used

Transmissivity: Fuss and Hammins, 2002
Flame Length: RFS PBP, 2001
Rate of Fire Spread: Noble et al., 1980
Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005
Peak Elevation of Receiver: Tan et al., 2005
Peak Flame Angle: Tan et al., 2005

Run Description: A North (Lots 1b & 1b)

Vegetation Information

Vegetation Type:	Rainforest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	21 Degrees	**Vegetation Slope Type:**	Upslope
Surface Fuel Load(t/ha):	8	**Overall Fuel Load(t/ha):**	10

Site Information

Site Slope	21 Degrees	**Site Slope Type:**	Upslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	5

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K)**	1090

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100

Program Outputs

Category of Attack:	HIGH	**Peak Elevation of Receiver(m):**	3.01
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	1165
Radiant Heat(kW/m2):	20.94	**Flame Angle (degrees):**	55
Flame Length(m):	2.67	**Maximum View Factor:**	0.311
Rate Of Spread (km/h):	0.23	**Inner Protection Area(m):**	5
Transmissivity:	0.887	**Outer Protection Area(m):**	0

Run Description:	B South-east (Lot 1b)		
Vegetation Information			
Vegetation Type:	Rainforest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	9 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	8	**Overall Fuel Load(t/ha):**	10
Site Information			
Site Slope	9 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	16
Fire Inputs			
Veg./Flame Width(m):	100	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100
Program Outputs			
Category of Attack:	HIGH	**Peak Elevation of Receiver(m):**	3.65
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	9230
Radiant Heat(kW/m2):	24.4	**Flame Angle (degrees):**	75
Flame Length(m):	12.81	**Maximum View Factor:**	0.378
Rate Of Spread (km/h):	1.79	**Inner Protection Area(m):**	16
Transmissivity:	0.849	**Outer Protection Area(m):**	0
Run Description:	C - East (Lot 1b & 1d)		
Vegetation Information			
Vegetation Type:	Rainforest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	0 Degrees	**Vegetation Slope Type:**	Level
Surface Fuel Load(t/ha):	8	**Overall Fuel Load(t/ha):**	10
Site Information			
Site Slope	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	13.5
Fire Inputs			
Veg./Flame Width(m):	100	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100
Program Outputs			
Category of Attack:	MODERATE	**Peak Elevation of Receiver(m):**	3.58
Level of Construction:	BAL 19	**Fire Intensity(kW/m):**	4960
Radiant Heat(kW/m2):	17.8	**Flame Angle (degrees):**	74
Flame Length(m):	7.44	**Maximum View Factor:**	0.274
Rate Of Spread (km/h):	0.96	**Inner Protection Area(m):**	14
Transmissivity:	0.855	**Outer Protection Area(m):**	0

Run Description:	D - South-east & south (Lot 1c & 1d)		
Vegetation Information			
Vegetation Type:	Rainforest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	18 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	8	**Overall Fuel Load(t/ha):**	10
Site Information			
Site Slope	18 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	23
Fire Inputs			
Veg./Flame Width(m):	100	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100
Program Outputs			
Category of Attack:	HIGH	**Peak Elevation of Receiver(m):**	3.64
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	17174
Radiant Heat(kW/m2):	27.6	**Flame Angle (degrees):**	77
Flame Length(m):	22.81	**Maximum View Factor:**	0.437
Rate Of Spread (km/h):	3.32	**Inner Protection Area(m):**	23
Transmissivity:	0.83	**Outer Protection Area(m):**	0
Run Description:	E - West (Lot 1a)		
Vegetation Information			
Vegetation Type:	Rainforest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	0 Degrees	**Vegetation Slope Type:**	Level
Surface Fuel Load(t/ha):	8	**Overall Fuel Load(t/ha):**	10
Site Information			
Site Slope	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	13.5
Fire Inputs			
Veg./Flame Width(m):	100	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100
Program Outputs			
Category of Attack:	MODERATE	**Peak Elevation of Receiver(m):**	3.58
Level of Construction:	BAL 19	**Fire Intensity(kW/m):**	4960
Radiant Heat(kW/m2):	17.8	**Flame Angle (degrees):**	74
Flame Length(m):	7.44	**Maximum View Factor:**	0.274
Rate Of Spread (km/h):	0.96	**Inner Protection Area(m):**	14
Transmissivity:	0.855	**Outer Protection Area(m):**	0